Papers and Originals

Medical Factors and Road Accidents

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A considerable amount of research has been done, and is being done, in various countries in an attempt to elucidate more accurately the part that medical factors may or may not play in the causation of road accidents.

In this paper a short review is given of some of the more relevant literature, and the results of three further investigations are described.

Earlier research may be subdivided into two broad categories: (*a*) investigations into the proportion of drivers rejected on medical grounds, and (*b*) investigations into the proportion of accidents in which medical factors were or might have been contributory.

Drivers Rejected after Medical Examination

In Pennsylvania during 1960–4 (unpublished report from the Pennsylvania Department of Health) all new applicants for a driver's licence were medically examined. Medical examination was also undertaken of all those drivers already licensed who were reported after an accident in which a medical condition was thought to be a factor, or for other reasons such as admission to a mental hospital, arrest and conviction for being under the influence of drugs or drink, arrest as a narcotic addict, because someone had declared them to be incompetent drivers, or because on their application form for a renewal of their licence they had given a physical condition which was disqualifying. Eyesight tests were performed by specially trained State Police. Doctors carried out the other medical examinations.

The total number of drivers examined during the period from June 1960 to June 1964 was 1,891,774, of whom 1,084,856 were applicants for their first licence and the remainder were for renewals. Of the first applicants, mostly young people, 827 (0.08%) were rejected. Of the applicants for renewals 30,131 (3.7%) were rejected (these included 3,832 who voluntarily withdrew because of "age, eyes failing, etc."). More than 40% of the 806,918 applicants for renewals were told they must wear glasses.

In Great Britain 1,276 commercial vehicle drivers were tested for fitness for military service (Webb, 1955); they were all under 45 years of age. Of these 183 (14%) were rejected as unfit for military service. This does not, of course, necessarily mean that they were unfit to drive motor vehicles.

The Lincolnshire police (unpublished report) performed eyesight tests—that is, reading a number plate at 25 yards (23 metres)—on a spot sample of drivers in 1964 and found that 24 out of 440 (5%) failed the test. The Derbyshire police (unpublished report) also carried out a similar spot test in 1964, and found that 4.6% of the drivers and riders tested had eyesight below standard. A personal communication from the Ministry of Transport stated that in 1963 0.09% of driving test failures were due to defective eyesight. The Metropolitan Police Driving School rejects about 0.4% of applicants annually as a result of eyesight tests which correspond to reading a number plate at approximately 35 yards (32 metres). On the other hand, in Salford a spot eyesight test of 1,457 motorists showed that one-third of them had defective vision (*Hansard*, 1964). This was part of a general health check-up organized by the medical officer of health, and the standards used were determined by an ophthalmologist. It is not known if the drivers tested were a representative sample of the driving population.

Norman (1960) found from tests carried out in 1959 that 73 (3.4%) out of 2,130 drivers of London Transport buses were unfit to drive, 51 because of a cardiovascular condition. These were drivers already employed by the London Transport Board. Twenty-two out of the 73 drivers who were found unfit were aged over 65 years. L. G. Norman (personal communication) has given some information on the number of people who applied for work as bus drivers with the London Transport Board and the numbers who were rejected on medical grounds. Table I summarizes his results. It will be seen that the numbers rejected varied between 12% of the total in 1962 and 9% in

TABLE I.—*Summary of Medical Acceptance and Classification of Rejection as London Transport Bus Drivers*

Medical Defects	1962	1963	1964	1965	1966	Total
Temporary (deferments)	73	73	100	140	126	512
Eyes:						
Visual acuity ..	217	213	224	290	236	1,180
Colour vision ..	59	50	63	72	46	290
Pathological defects	5	6	6	9	7	33
Chest:						
Lungs	3	6	4	9	3	25
Heart	45	57	37	79	61	279
Abdomen:						
Gastric	2	2	—	—	—	4
Renal	4	4	—	—	1	9
Herniae	3	2	1	3	—	9
Nervous system:						
Psychological ..	6	3	4	5	1	19
Neurological ..	11	9	6	8	9	43
Skin:						
Dermatitis (industrial)	1	1	—	—	—	2
Other skin lesions ..	1	2	2	—	1	6
Limb Defects:						
Upper limbs ..	2	2	5	6	1	16
Lower limbs ..	6	2	2	—	—	10
Varicose veins ..	—	—	—	3	—	3
Rheumatism:						
Including fibrositis and rheumatoid arthritis	—	4	—	1	—	5
General diseases:						
Diabetes, glandular diseases, etc. ..	3	3	6	9	16	37
Ears:						
Hearing	2	4	3	3	3	15
Pathological.. ..	10	9	6	1	7	33
Physique	2	—	2	2	—	6
Refused Medical examination.. ..	2	2	2	1	3	10
Total rejected ..	457	454	473	641	521	2,546
Total passed ..	3,216	3,255	3,517	4,252	5,399	19,639
Total examined ..	3,673	3,709	3,990	4,893	5,920	22,185

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1966, with an average of 11%. Defects in visual acuity accounted for nearly 5% of the total examined and for 46% of the rejections.

The most noticeable feature of the results of medical examination by these different authorities is the wide variation which exists between them.

Accidents with Contributory or Causative Medical Factor

The second type of investigation is concerned with the proportion of accidents in which a medical factor may have been contributory or causative. The information available for this type of investigation is not easy to assess. However, certain evidence has been obtained which gives some quantitative results.

Sudden Illness and Accidents

Sudden illness, usually leading to complete or partial loss of consciousness, is a well-recognized cause of accidents, though not a common cause. The following acute medical conditions are most commonly named as causative factors: coronary thrombosis, epilepsy, cerebral or subarachnoid haemorrhage, cerebral tumour (either primary or secondary) resulting in an epileptiform fit, hypoglycaemia (in diabetes), laryngeal vertigo or sudden nausea, acute psychiatric states, and vasovagal attacks.

Norman (1967), in his study of London bus drivers, found that coronary thrombosis caused seven accidents in 13 years. There were 14 incidents due to coronary thrombosis which did not lead to accidents. In addition there were 51 other incidents in which a driver lost consciousness while driving, owing to other medical conditions, and in these 37 accidents resulted. Table II shows the diseases listed as causative.

TABLE II.—*Medical Condition Causing Incident or Accident (Norman, 1967)*

Disease	No. of Cases of Loss of Consciousness	No. of Cases Resulting in Accident
Coronary thrombosis	21	7
Laryngeal vertigo	2	2
Vasovagal attack	15	11
Probable epilepsy	15	12
Cerebral haemorrhage	2	1
Reactive hypoglycaemia	3	2
Loss of consciousness of unknown origin	6	5
Hypertension	3	2
Haematemesis	1	0
Cerebral astrocytoma	1	0
Cerebral embolism	1	1
Transient cerebral ischaemia	1	1
Ruptured aorta	1	0
Total	72	44

London Transport drivers have about 20,000 reported accidents a year; there were 44 accidents caused by loss of consciousness in 13 years; this gives a rate of incidence of about 1.5 per 10,000 accidents caused by sudden illness. It is to be noted that the reported accidents were mainly minor non-injury accidents. The incidence figure cannot therefore be compared directly with rates calculated from police sources.

Herner *et al.* (1966), in Sweden, found that out of 44,255 accidents reported to the police (during 1959–63), 41 cases were or probably were caused by sudden illness of the driver, usually with accompanying loss of consciousness. Table III shows the diseases listed as causative. Out of these 41 accidents 14 resulted in driver injury and seven resulted in injuries to another person.

McFarland (1965) quotes an unpublished report (1960) from Sweden in which police accident investigators found that 29 out of 25,473 reportable accidents were thought to have been due to a sudden medical episode affecting the driver.

It will be seen that both Swedish investigations give an incidence rate of about 1 per 1,000 accidents caused or probably caused by sudden illness of the driver.

It has been stated (Elliott, 1963) that five accidents occurred in the County of Kent in three and a half years which were due to epileptic drivers having a fit while driving. The average number of personal injury accidents in Kent during the years 1956–60 was 6,300. This gives a figure of about 0.2 per 1,000 personal injury accidents possibly due to epilepsy, assuming that the five cases referred to were all personal injury accidents.

TABLE III.—*Medical Condition Causing Accident (Herner et al., 1966)*

Disease	No. of Cases
Coronary thrombosis	7
Epilepsy	10
Cerebral tumour with epileptic fit	2
Subarachnoid haemorrhage	2
Cerebral haemorrhage	1
Arteriosclerotic or rheumatic heart disease with Stokes–Adams syndrome	3
Diabetic hypoglycaemia	3
Psychosis with acute confusional state	1
Sudden loss of self-control due to acute nausea or coughing attack	7
Vasovagal attack	5
Total	41

Chronic Disease and Accidents

The literature on the relation between chronic illness and accidents is extensive, but most of the papers do not make use of control groups.

Two recent papers are, however, worth quoting. Waller (1965), in an investigation in California into 2,602 drivers with known chronic medical conditions compared with a control group of 922 drivers who were thought to have been in a normal state of health, concluded that drivers with diabetes, epilepsy, cardiovascular disease, alcoholism, or mental illness averaged twice as many accidents per 1,000,000 miles of driving as drivers without such diseases.

On the other hand, Ysander (1966) in Sweden, in a study of 612 drivers with chronic disease, mainly diabetes, cardiovascular disease, renal disorders, and diseases of the sense organs, stated that the percentage of drivers in the disease group experiencing accidents (4.1%) was about half that of the drivers in the control group (7.7%).

The proportions of diseases covered in the two investigations were, however, not the same. For example, whereas epilepsy was the commonest disease in the American sample (1,122 out of 2,602 cases), there were only six cases of epilepsy out of the 612 cases in the Swedish series, and alcoholism is not mentioned in the Swedish paper.

Some unpublished information on chronic medical factors which may have contributed to accidents comes from the Accident Research Branch of the Metropolitan Police, the information being limited to the more straightforward disabilities—that is, age deterioration or obvious chronic illness. The police interviewed 659 persons involved in personal injury accidents. Only nine (1.7%) of the 534 drivers and motorcyclists who were interviewed had medical defects which it was thought might have contributed to the accident. Their results, for all classes of road users, are shown in Table IV.

TABLE IV.—*Road Users with Chronic Disease or Disability Possibly Contributory to Accident (Metropolitan Police, 1965)*

Class of Road User	No. of Cases	Percentage
Drivers and motor-cyclists	9 out of 534	1·7
Pedal cyclists	2 „ „ 34	5·9
Pedestrians	17 „ „ 91	18.7

Physique and Accidents

Malfetti and Fine (1962) studied six drivers of commercial vehicles who were chosen from 1,000 commercial vehicle drivers

who had not had what was said to have been a reportable accident for 20 years. The six chosen were those who ranked highest in regard to exposure to risk. It was found that they were no better physically than the average for their age, so that there appeared to be no relation between physique and accidents.

Deafness and Accidents

Deafness is usually thought not to be a factor in accidents. In Colorado (National Symposium, 1962) deaf drivers were said to have had about half the number of accidents of the non-deaf. This was confirmed by reports from several other States (Finesiller, 1961). However, in California the average deaf driver was said to have had 1.78 times the number of accidents of the average non-deaf driver (Coppin and Peck, 1963).

Defective Vision and Accidents

Fletcher (1948) found that out of 103 fatal accidents at road junctions 71 involved a driver with defective vision in one eye; 61 of these accidents occurred when the approaching other vehicle was on the side of the bad eye. Smeed (1953) reviewed the available evidence on the effect of defective vision on road accidents. He found that drivers with eye defects tended to be involved in more accidents but that the evidence was not completely satisfactory in that the correlation could have been due to correlation between eye defects and other factors.

Ysander (1966) quotes official French statistics (1962) as showing that one-third of all fatal accidents were due to defective vision or to an abnormal reaction to a visual stimulus. He also quotes a German study (1961) of 4,011 accidents in which only one accident was found to have been caused by a visual disturbance in the driver.

A further indication of the differences that may be found between the results of different investigations is given in *Research on Road Safety* (1963) and is shown in Table V.

Norman (1960) found that 149 colour-defective bus drivers did not have more accidents than 149 drivers with normal colour vision who were matched for age, length of service, and mileage.

TABLE V.—*Relation Between Visual Acuity and Accidents* (Research on Road Safety, 1963)

Investigation	Percentage of Sample With Poor Acuity		Statistically Significant
	Accident Group	Accident-free Group	
Brody	16	8	No
Connecticut ..	27	36	No
Michigan	14	5	Yes
Fletcher	5·0	1·0	Yes

Cashell (1966), using a wide range of static eyesight tests, found that there was no apparent difference in visual efficiency between 30 drivers who had had recent serious injury accidents and 30 control drivers with an accident-free record, matched for age, sex, and driving experience. Night vision was not investigated.

It is possible that dynamic vision testing (Hulbert *et al.*, 1958) may show up differences not recorded by static testing.

Present Investigations

The investigation which has been undertaken at the Road Research Laboratory may be divided into three parts.

Chronic Disease or Disability

Dr. R. M. Collister, while at the Road Research Laboratory (unpublished note) interviewed 811 patients admitted to hospital who had been involved in road accidents, and obtained from them information which included whether they were suffering from a disease or physical defect at the time of the accident. The incidence of chronic disease or disability in the different age groups and in the different road user groups is shown in Table VI. It will be seen that the incidence of chronic disease, as is to be expected, increases with age and that it is higher among pedestrians and cyclists than among drivers and riders.

The coexistent diseases or disabilities found included asthma, diabetes, epilepsy, migraine, auditory defects, congenital defects, alcoholism, low mental function, gastroenterological disease, and cardiovascular disease. Visual defects were not investigated. It was not possible to determine whether a particular chronic medical condition was likely to have been contributory to a particular accident or not. One accident out of 513 serious injury accidents to drivers and motor-cyclists was caused by sudden illness (epilepsy) in a motor-cyclist.

The numbers of cases of each disease or disability were too small to permit comparison with the national incidence for that disease or disability. However, the rate of incidence of auditory defects among elderly pedestrian casualties appeared to be very much higher than the national incidence as given by Logan and Cushion (1958), even when the greater ages of the pedestrian casualties are taken into account. There were 35 pedestrians aged 65 or over and nine of them were deaf, an incidence of 250 per 1,000 compared with the national incidence in 1955–6 of 5.5 per 1,000 persons aged 65 and over.

Sudden Illness: Small-scale Investigation

One of us (E. G.) investigated 593 unselected drivers and motor-cyclists admitted to hospital during 1964–6 on account

TABLE VI.—*Casualties with Chronic Diseases by Age and Class of Road Users (all Passengers excluded) (Basic data: Collister et al. unpublished)*

Age	Drivers of Motor-cars (141)			Riders of Motor-cycles (248)			Riders of Scooters (86)			Riders of Mopeds (24)			Drivers of Heavy Vehicles (14)			Pedestrians (149)			Pedal Cyclists (149)			Total (811)		
	Total Casualties	Cases of Disease	Disease as % of Total	Total Casualties	Cases of Disease	Disease as % of Total	Total Casualties	Cases of Disease	Disease as % of Total	Total Casualties	Cases of Disease	Disease as % of Total	Total Casualties	Cases of Disease	Disease as % of Total	Total Casualties	Cases of Disease	Disease as % of Total	Total Casualties	Cases of Disease	Disease as % of Total	Total Casualties	Cases of Disease	Disease as % of Total
0–14	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	20	—	—	33	4	12	53	4	8
15–24	40	3	7	178	10	6	34	2	6	7	—	—	3	—	—	18	1	6	37	2	5	317	18	6
25–44	50	4	8	52	3	6	33	4	12	4	—	—	8	—	—	17	2	12	16	3	19	180	16	9
45–64	46	7	15	18	3	17	18	2	11	12	1	8	2	—	—	55	20	36	46	16	35	197	49	25
65+	5	1	20	—	—	—	1	—	—	1	—	—	1	—	—	39	17	44	17	6	35	64	24	37
All ages	141	15	11	248	16	6	86	8	9	24	1	4	14	—	—	149	10	27	149	31	21	811	111	14
Male	123	13	11	246	16	6	75	8	11	23	1	4	14	—	—	82	22	27	107	22	21	670	82	12
Female	18	2	11	2	—	—	11	—	—	1	—	—	—	—	—	67	18	27	42	9	21	141	29	21

Note: This table sets out the incidence of chronic disease in various classes of road user. No attempt has been made to break down the diseases into contributory and non-contributory.

of the injuries they had sustained in road accidents (and which were therefore usually of a severe nature) for evidence of sudden illness in the driver or rider which might have caused the accident.

Out of the 593 drivers and motor-cyclists two cases of sudden illness leading to loss of consciousness causative for the accident were found. One, a youth aged 18 years driving a car, had a fainting attack after a recent attack of influenza ; the other, a woman aged 81 driving a car, had a cerebral haemorrhage. In both instances injuries were caused to other car occupants ; the woman driver died within 24 hours from a combination of her injuries and the cerebral catastrophe. This investigation gives an incidence rate of about four serious injury accidents per 1,000 caused by sudden illness of the driver.

Out of the 593 drivers and riders examined, in addition to the two cases of sudden illness, there were three cases of chronic disease which it was thought might have been contributory to the accident. One, a woman aged 58, driving a car, had hypertension (B.P. 210/100) and was on a hypotensive drug ; another, a man aged 73, driving a car, had diabetes with peripheral neuritis, bilateral lens opacities, and partial deafness ; the third, a man aged 75, riding a scooter, appeared to have been mentally confused and was partially deaf.

Sudden Illness : Large-scale Investigation

In a further investigation (E. G.) the police records of 9,390 minor injury and serious injury accidents (including fatalities) reported to the police in one county of England during 1963–4 were searched for accidents in which sudden illness in drivers or motor-cyclists, leading to partial or complete loss of consciousness, might have caused the accident.

All likely cases were traced back to the hospitals to which they were taken after the accident, and with the co-operation of the medical staff their hospital records were analysed. After analysis about half of the 29 cases originally selected (15 out of 29) were accepted as having been caused or probably caused by acute illness occurring in the driver or rider. Table VI shows the results obtained.

TABLE VII.—*Medical Condition Causing Accident*

Disease	No. of Cases
Coronary thrombosis	2
Acute left ventricular failure	1
Cerebral haemorrhage	1
Epilepsy	3
Laryngeal vertigo	1
Hypoglycaemia	1
Loss of consciousness of uncertain or physiological origin—i.e., blackout or fainting attack	6
Total	15

Out of the 15 cases of acute illness, 13 were in drivers of cars and two in riders of motor-cycles, one rider and one driver dying at the wheel, the driver receiving no injuries and his passenger minor injuries, the rider receiving minor injuries only. Of the 15 cases of illness eight resulted in serious injury accidents and seven in minor injury accidents.

This type of investigation does not allow quite the same standard of accuracy of observation of individual cases as was possible in the first investigation described above, but the numbers are statistically more adequate. The rate of incidence in this investigation is about 1.5 minor or serious injury accidents per 1,000 caused or probably caused by sudden illness of the driver or rider.

Discussion

In 1956 the World Health Organization produced a study of standards of fitness desirable in drivers. The recommendations were based almost entirely on arbitrary assumptions, and there was little evidence to show that drivers who were not up to these standards had an unduly large accident rate.

Since the publication of this report in 1956 more information concerning the part medical factors may or may not play in the causation of road accidents has become available. The different methods of investigation used have not, however, been equally informative.

Investigations recorded in the literature into the proportion of drivers rejected after medical examination must be regarded as unsatisfactory as evidence of unfitness to drive because of the wide variation in results, the differences probably depending on the standards of fitness used. For example, 0.08% of applicants for driving licences in Pennsylvania were rejected compared with 11% of applicants for employment as drivers of London buses. Similarly, vision-testing showed that from 0.09 to 33% of drivers apparently had defective eyesight.

Investigations into the relation between chronic disease or disability and accidents have also produced markedly differing results. Thus Waller (1965), from California, concludes that drivers with diabetes, epilepsy, cardiovascular disease, alcoholism, and mental disorders averaged twice as many accidents as their control group. On the other hand, Ysander (1966), in Sweden, found that drivers with diabetes, cardiovascular disease, renal disorders, epilepsy, and diseases of the sense organs had about half the number of accidents compared with the control group. Both the State of California and Sweden regulate the driving privileges of drivers with chronic medical conditions, though there are probably some differences of degree in their application. For example, from the information available to us it would seem that the medical requirements for the granting of a licence to drive are, for epileptics, rather more liberal in California than in Sweden.

The incidence of accidents related to chronic medical conditions would not appear to be high. Nine out of the 534 drivers or motor-cyclists (1.7%) of the Metropolitan Police investigation quoted were thought to have had a chronic disease which might have contributed to the accident. The rate of incidence for cyclists and pedestrians appeared to be higher. It is to be noted that chronic disease or disability is usually only contributory to an accident rather than directly causal.

In our own series of cases examined in hospital there were three cases of chronic disease in drivers out of 593 car or motor-cycle accidents (0.5%) in which it was thought that a medical defect might have been contributory to the accident.

It has not been shown that disabilities such as colour blindness or loss of hearing (except perhaps in elderly pedestrians) have a large or indeed any effect on accidents. The results of investigations into the relation between visual defects in drivers and accidents are to date conflicting.

The role of sudden illness in road accidents is, on the other hand, better defined, and the results from different investigations are more comparable. It appears to be widely agreed that the incidence rate of acute medical factors leading to accidents among drivers of cars and riders of motor-cycles or scooters is about 1 per 1,000 accidents (World Health Organization, 1966). The results of Herner *et al.*, 1966, quoted above, show an incidence of about 1 per 1,000 accidents caused or probably caused by sudden illness. He quotes figures of incidence from other countries which vary from 1 to 3 per 1,000. The criteria of investigation were, however, not necessarily the same in the different countries. The results of our own larger investigation showed an incidence of about 1.5 per 1,000 accidents. The two studies were comparable except that

TABLE VIII.—*Quantitative Relation Between the Commoner Specific Illnesses Causing Accidents in Great Britain and Sweden*

Medical Condition Causing Loss of Consciousness	Present Series. No. of Cases Out of 9,390 Accidents	Herner *et al.* (1966). No. of Cases Out of 44,255 Accidents
Coronary thrombosis	2	7
Cerebral catastrophe	1	3
Epilepsy	3	10
Hypoglycaemia	1	3

in our series hospitals were not asked for information independently of the police, and, in addition, the Swedish police figures for total accidents appear to contain property damage non-injury accidents, whereas the British police figures used were confined to injury accidents.

It is interesting to notice that the quantitative relation between the commoner specific diseases is about the same for both investigations (see Table VIII).

It is possible that accidents caused by sudden illness may be more likely to result in serious injury than in minor injury. There are between two and three times as many minor injury accidents as serious injury accidents (including fatal accidents) in Great Britain annually. But, in the larger investigation carried out by us, out of 15 accidents caused by sudden illness there were eight serious injury accidents and seven minor injury accidents. This apparent trend towards serious injury may account for the higher rate of incidence (4 per 1,000) found in our smaller investigation, which was confined to cases sufficiently seriously injured to be admitted to hospital, and also for the slightly lower rate of incidence in Sweden compared with this country (1 as against 1.5 per 1,000). Deaths at the wheel are, however, probably not associated with a high serious injury rate to other road-users (Herner *et al.*, 1966). From the 15 cases studied no pattern emerges to relate any particular type of sudden illness to severity of accident.

Norman's (1967) study of sudden illness in bus drivers shows an incidence of about 1.5 per 10,000 accidents caused or probably caused by an acute medical factor; this is substantially lower than the figures found by other authors. A possible explanation may be that the bus accidents were mainly minor non-injury accidents, whereas the police figures used by other investigators were mainly or wholly for injury accidents. The possibility must be considered also that medical supervision was a major factor in the lower figure of incidence, but the unpredictability of onset of the majority of illnesses concerned perhaps makes this unlikely.

Conclusions

It is concluded that the incidence of sudden illness in drivers or motor-cyclists as a cause of road accidents is low: in our larger series of minor and serious injury cases (including fatalities) it was 1.5 per 1,000. In our smaller series, confined to cases of serious injury, the incidence was 4 per 1,000. The difference in incidence may relate to the probability that accidents caused by sudden illness, though few in number, are more likely to result in serious injury than in minor injury.

Our results also suggest that the incidence of chronic disease as a contributory factor to accidents is low—out of 593 serious-injury accidents to drivers or motor-cyclists 0.5% were associated with a chronic medical condition which might have contributed to the accident. It should be noted that defective vision was not investigated in this series of cases.

So far as sudden illness is concerned the precise nature of the medical requirements for the granting of a licence to drive would seem to make little difference to the number of accidents that this type of illness causes. For example, the medical requirements in Sweden and Great Britain are different, but from the information so far available the proportion of accidents caused by sudden illness in the two countries would appear to be of the same order—that is, 1 per 1,000 in Sweden compared with 1.5 per 1,000 in Great Britain. The quantitative relation between the commoner specific illnesses causing accidents in the two countries is similar.

Summary

A review is given of some of the more relevant published and unpublished information relating to medical factors in road accidents. Three further investigations undertaken at the Road Research Laboratory are reported on; an investigation into 811 seriously injured road users of all categories, an investigation into 593 seriously injured drivers or riders of motor-cycles or scooters, and a further investigation into 9,390 serious or minor injury accidents (including fatalities) reported to the police in one county of England.

It is concluded, both from the review of the literature undertaken and from our own investigations, that the overall rate of incidence of sudden illness in drivers or motor-cyclists as a definitive cause of road accidents is low—that is, of the order of 1 per 1,000.

Conclusions in regard to the relation between chronic disease or disability and road accidents are more difficult to draw. Two recent investigations, one from Sweden and one from California, both using control groups, seem to have given contradictory results. The rate of incidence would not, however, appear to be high.

The work described in this article was carried out as part of the programme of the Road Research Laboratory. We are grateful to Dr. Ruby Collister, who collected some of the data on which this report is based during her appointment at the laboratory, and to Dr. L. G. Norman, Chief Medical Officer to London Transport, for his valuable comments on the proofs of the manuscript. Our thanks are also due to Mr. W. P. Tapley, Head of the Ministry of Transport Road Safety Unit, Southampton, for the factual accident information obtained relating to our larger investigation, and to the numerous doctors in various hospitals who have been kind enough to provide medical information about the cases investigated.

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